

Challenge Practice

1. Sample answer: $x^2 + 25 = 0$ 2. Sample answer: $(x + 3)^2 + 8 = 0$ 3. 1 4. -1

5. False. If the complex number is real, the number equals its conjugate. 6. False. Sample answer: The sum of two imaginary numbers can be a real number or an imaginary number. For example, the sum of $4 + 2i$ and $3 - 2i$ is 7, which is a real number.

7. True. $(a + bi)(a - bi) = a^2 - bi + bi - bi^2 = a^2 - b^2(-1) = a^2 + b^2$, which is a real number. 8. True. The absolute value of $a + bi$ is $\sqrt{a^2 + b^2}$ and the absolute value of its conjugate $a - bi$ is $\sqrt{a^2 + (-b)^2} = \sqrt{a^2 + b^2}$.

9. Sum of complex numbers: $a + bi + c + di = (a + c) + (b + d)i$; Complex conjugate of sum: $(a + c) - (b + d)i$; Sum of complex conjugates: $a - bi + c - di = (a + c) - (b + d)i$

10. Product of complex numbers: $(a + bi) \cdot (c + di) = ac + adi + bci + bdi^2 = (ac - bd) + (ad + bc)i$; Complex conjugate of product: $(ac - bd) - (ad + bc)i$; Product of complex conjugates: $(a - bi)(c - di) = ac - adi - bci + bdi^2 = (ac - bd) - (ad + bc)i$ 11. $h \leq h_0$